7 December 1998

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
1919 M Street NW, Room 222
Washington, DC 20554

Dear Ms. Salas:

I have performed a cursory reviewed of the FCC*s Notice of Inquiry (NOI) = in the matter of Revision of Part 15 of the Commission*s Rules Regarding = Ultra-Wideband Transmission Systems, FCC 98-208, ET Docket No. 98-153. = While I do not pretend to understand the full implications of the NOI, I = do foresee problems for major classes of geophysical survey systems if = restrictively regulated. Some of these geophysical survey systems have = been used successfully worldwide for many decades, while some systems are = emerging technologies with great potential. =20

The classes of geophysical survey systems (methods), that might potentially= be included under the broadest umbrella of the NOI, include ground = penetrating radar (GPR), frequency domain electromagnetic (FDEM) induction,= and time-domain electromagnetic (TDEM) induction. While these geophysica= l systems are useful for a broad range of requirements and problems, the = primary areas of applicability can be summarized as follows:

a. Natural resources exploration and assessment, including strategic = ore deposits and ground water;
b. Subsurface geology mapping, for various uses including input to = groundwater and contaminant transport modeling;
c. Foundation assessment for construction projects;
d. Environmental cleanup and restoration, including soil and groundwate= r contamination;
e. Military-specific applications
   --cavity and tunnel detection (including clandestine tunneling and = underground facilities)
   --unexploded ordnance detection and cleanup
   --landmine detection, including humanitarian de-mining
   --water supply
f. Archaeological / cultural resources detection and mapping (e.g., = artifacts and graves)
g. Forensic studies to aid law enforcement agencies (e.g., drug caches = and clandestine burials)
h. Natural disaster response for damage assessment and survivor rescue
i. Infrastructure (e.g., roads, bridges, buildings) assessment, = including the techniques known as non-destructive testing
=09
As a Senior Research Geophysicist for the U.S. Army Corps of Engineers, I = consider the use of the above classes of geophysical survey systems = (methods) for applications such as foundation assessment at construction = sites, environmental cleanup and restoration, unexploded ordnance and = landmine detection, and infrastructure assessment to be mission-critical. = And as a geophysics professional, I view any restrictive regulation of the = subject geophysical methods as potentially crippling to realizing the = overall capabilities of geophysics for contributing to solution of = nationally significant problems and requirements

The key distinguishing features of the geophysical systems are (1) the systems are closely ground-coupled, (2) low power output, (3) limited duty cycles, (4) some of the systems are shielded to prevent radiation into the air, and (5) the numbers of systems in use worldwide are quite small and not expected to grow by more than a factor of ten in the foreseeable future. Most of the geophysical systems are operated on the ground surface or within 1-2 m of the surface. The commonly used GPR systems are closely ground-coupled and are pulsed or time domain systems, operating at center frequencies of 10 MHz to 2-3 GHz, with bandwidth to center frequency ratios of approximately one The GPR*s are very low output power devices. Typically, the peak output power for a GPR is less than 10 watts, and with the limited duty cycles, the average powers are a few tens of milliwatts. Many of the GPR*s are shielded to prevent radiation into the air and reflection from surface and above-ground objects. The total number of GPR systems worldwide is less than 2,000, with a much smaller number in use at any given time. GPR*s have been available commercially since the early 1970*s, so it is not a new technology or application. Prototype, research GPR systems existed for several decades prior to the commercial availability.

The FDEM induction systems typically operate over the frequency range of a few hundred Hz to 25-30 KHz. Some of the systems operate at a single frequency in a continuous wave mode, while others can generate several frequencies over their bandwidth *simultaneously* with digitally synthesized input waveforms. Output power of these systems is typically less than 5 watts. These systems are carried by the system operator at heights of 1 m or less above the surface. The transmitters are simple vertical or horizontal magnetic dipoles (wire loop or coil transmitters). Total number of these systems in operation worldwide is the order of 1,000.

The TDEM induction systems typically operate by rapid turnoff of a current in a transmitter loop, thus generating a wide bandwidth signal. The bandwidths for the systems can extend from 100 Hz to 500 KHz theoretically, but in principle the useable bandwidth for the application (portion of bandwidth above background noise level) is much smaller. The peak output power of these systems can be 100 watts, but the average power over the bandwidth is much smaller; and the average power over the duty cycle is 50% that of the average bandwidth power. The systems typically operate in a vertical magnetic dipole transmitter mode and are carried less than 1-m height above ground. The total number of these systems worldwide is of the order of 1,000. Both the FDEM and TDEM systems are designed to couple inductively with subsurface materials and not to radiate energy. Any radiated energy is unintentional.

In the 25 years that I have been familiar with these type geophysical systems, I know of no reported case of interference with communications or other types of electronic systems. It is common, however, for nearby electromagnetic emitters to interfere with the geophysical systems.

In summary, the subject geophysical systems are all low power, closely ground-coupled, and few in number. The geophysical systems make significant contributions to solution of nationally important requirements and problems. The planned 1999 report of the National Research Council Committee for Non-Invasive Characterization of the Shallow Subsurface for Engineering and Environmental Applications, known as the SITE Committee, documents the many applications of geophysical methods and outlines the future potential of the methods for increasingly significant contributions

to important national problems.=20

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